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DECEMBER 19.

Mr. VAUX, Vice-President, in the chair.

Thirty-five members present.

Mineralogical Notes.—Mr. JOSEPH WILLCOX said that the two fine crystals of scapolite, which were presented this evening by Mr. Vaux, were found at a new locality for this mineral, in St. Lawrence County, N. Y., and that a specimen from the same locality had recently been received in this city which weighs about 25 pounds, and is probably the largest scapolite crystal ever found.

He also referred to a specimen of quartz on the table from the well-known locality of green quartz at Blue Hill, in Delaware County, Pa. This specimen had been exposed to the weather for a few weeks, and had lost nearly all its green color. This green quartz is found in several veins of chlorite, much decomposed, and each of different intensity in color. The quartz occurring in each vein corresponds in color to the matrix.

Impurities in Drinking Water.—Mr. WILLCOX also stated that, during the last eight years, whenever the Schuylkill River has been covered with ice, he observed that the water supplied by the city possessed a disagreeable odor and taste, like chlorine. Large quantities of chloride of lime are daily used at Manayunk and at the Wissahickon for bleaching purposes, and the chlorine gas is liberated from it by the application of alum and sulphuric acid. A large portion of the chlorine gas subsequently escapes from the water before it reaches Fairmount; but when the river is covered with ice, this process of purification is retarded, and the offensive element is practically conveyed, in a covered trough, from the mills to the pumps that supply our city with water. He was not competent to state if chlorine in this condition is prejudicial to health. Being a powerful disinfectant it may be a providential interposition for the prevention of disease that might be caused by the foul material that is carried in such profusion through the sewers into the Schuylkill River, and which, on account of the ice, would otherwise be transported into our water-pipes in its original impurity.

On Excrescences and Excentric Wood Growths in the Trunks of Trees.—Mr. THOMAS MEEHAN said that on many trees were peculiar excrescences, which, up to a few years ago, had been referred primarily to insect origin. Cutting these through lengthwise there was no appearance of this agency. There were layers of wood of annual growth, just as in the normal parts of the tree.

Examining some oak knots of this character, and finding pulverulent fungoid matter abundant on the surface, he said he had introduced some of these to the Academy a few years ago, and suggested this as a substitute for the insect theory, but subsequently Professor Farlow had kindly examined them critically and found no trace whatever of fungoid matter in their structure. This left us wholly in the dark as to the exact origin of these stuctures.

It was worth noting that these excrescences were often of a uniform character in each species of tree. In many cases, no matter how large or how old they were, they would separate from the parent stem easily by a short sudden blow. He had made collections of these and in most cases found great uniformity. In *Quercus obtusiloba* they were depressed globose, in *Fagus sylvatica* (American beech) they were convex and oval, with the narrow ends crosswise with the trunk. In the *Acer rubrum* (red maple) they were oval but drawn out lengthwise. In the common weeping willow they varied very much in size, sometimes being as large as a bushel measure, but always knocking out easily as in all named before. In the common cherry (*Cerasus avium*) and the paper mulberry (*Broussonnetia papyrifera*) the excrescences were also very irregular in form, and seemed to have a stronger attachment to the parent stem than the others. The apple had very small and numerous ones in some species; and it was from an examination of these, he said, that he had derived the key to the whole subject. On the bark of some kinds of apple trees numerous small pea-like projections would exist on the bark within a space of a few inches. On cutting open, these were found to be not vesicular, but to be filled with hard and perfect wood. A careful examination showed that these woody masses took their rise seemingly from the liber, to which, in the newly formed cases, they would be found still attached by a small thread-like vessel.

In order to understand their formation, it was necessary to understand how wood was made. In many trees the annual layer was so regular, and seemed to be placed so nicely, that one not a botanist might be pardoned for believing that the sap was changed to woody matter in the leaves, and the new formed matter sent down, sliding over the old layer like the sections of a telescope; but though the food was prepared by the leaves in a great measure, the actual growth was made by the germination of some of the cells along the whole outside wall of last year's wood beneath the inner bark. In his own observations of this process he had taken the common cherry for his experiments. The germination of the cells takes place here about the middle of June. He takes a healthy cherry tree and strips it entirely of its bark to any length desired. At that season a viscid liquid will be found covering the woody surface in abundance. The stripped part is covered with a cloth to prevent evaporation, and in a few days numerous dots, like needle points, will be seen about the sixteenth of an inch apart all over the surface. These are the young cells which have germinated from those of last year. They continue germinating, one from the other, until they meet, when they unite and form a complete surface. In the fall a layer of wood will be found just as thick as in the part of the tree not disbarked, and a single layer of liber, with its outer coat of cellular matter—perfect bark—will have been formed over the whole. The entire formation of wood and bark can thus be seen by the ordinary observer, without the necessity of any nice microscopical work. Other people have tried the experiment with other trees. He has seen large apple trees that have had their bark peeled wholly off from their trunks, at the season named, make an entire new layer of bark and wood, not only with no injury to the tree, but to its manifest enjoyment; but his own experiments were confined exclusively to the cherry.

By this experiment we learn that there is no difference primarily in any part of the annual covering. The same cell may become permanent tissue or generating tissue—and from the generative tissue may come before the season of growth closes every form of structure known to anatomists, from pure wood to the outermost cuticle of the bark. How these cells become differentiated may be passed over here. We know that cell-growth is not always uniform in its operations. The law that changes the outermost series of newly made cells into liber need not necessarily operate so exactly as to make them perfect to this end—a few may be thrown off into the liber as generative tissue—and, granting this possibility, we see how the woody granules in the apple bark are formed.

How cells usually of one character may be made to assume others is shown in the formation of adventitious buds. Sachs (Text Book, Eng. ed., p. 563) thinks that few dicotyledons produce adventitious buds. The shoots that often spring from the bark of the older stems of trees, he says, are probably from dormant buds which have retained vitality, though buried from the first growth of the stem. This sort of growth is true. In *Gymnocladus* the buds formed the first year in the axil of the leaves are in a linear series of three or more, of which but one is generally seen above the surface; but after many years, if the bark be gently shaved, these will be found just beneath the surface as they were the first year, having kept along their hidden growth all that time. In some magnolias (*M. acuminata*, *M. tripetela*), besides the axillary bud one forms exactly horizontal to it, on the side opposite to the direction of the spiral growth. This bud is rarely seen above the surface, and has not been before made known to botanists as I believe, but may always be found beneath the surface of the stronger shoots when the bark is gently shaved, no matter how great may be the age, unless, as sometimes happens, some accident should favor its development to a perfect branch. These are the sort of buds referred to by Prof. Sachs, and of course make up their share of new branches when time comes to favor them. He knew of no dicotyledonous tree that could not be made to throw out numerous adventitious buds from any part of its surface by sawing off. In our common street maples this was everyday experience. A few inches below the cut generally died back from evaporation of the juices; but when the shoots pushed out they came by the dozens in the space of a few inches. Now in the original shoot—the first year's growth—there would be found in a vigorous specimen seldom more than six buds in a length of six inches; but in a strong six year old branch of maple (*Acer dasycarpum*) cut back he had seen as many as fifty shoots in that space. He exhibited a one year shoot of *Catalpa*, where the normal buds were ten inches from each other. In old branches cut back in early winter, so that the surface may harden a little before spring, and thus the tree lose little of its juices by evaporation, shoots will come out numerously from any part of the foot space between these original buds.

It was interesting, however, to note that in no case that he knew of would adventitious buds be produced between the nodes from a one year old branch. Such a branch cut beneath the node invariably died to the next. It would seem as if the demand on the nutritive powers of the plants for the axial elongation had left the generative tissue with less power than in subsequent years they may possess.

How cells which under some circumstances become permanent tissue, or at best generative tissue, may become the parents of adventitious buds and shoots was well shown in cutting down horse chestnuts, some poplars, and some birches. As before said, during the season following the first year, no adventitious buds will form between the nodes, when the branch is shortened; but in the older trees, the new cells from the generative tissue all along the exposed part or surface of the stump form adventitious buds and branches. The whole circle between last year's wood and the bark produces a forest of branches. He had seen this also, he said, in Cotyledons and other succulents under greenhouse culture.

From these considerations there was no reason why cells, predestined, under ordinary circumstances, to be merely bark cells in their change from wood cells, should not occasionally retain enough of growth force to carry on a feeble wood constructing system of their own.

We thus come naturally to the origin of these woody excrescences. Imperfectly formed liber cells, still retaining their generative power, would make a growth the next season, forming a layer of wood and making its own cortical layer, simultaneous with the normal wood growth of the tree, assimilating from the same store of reserve material that the normal growth does. The proof of all this lies in the cutting through longitudinally of one of these excrescences when it will be found to have made one more annual layer from the point of its origin than the tree itself, showing that the origin dated from a double set of germinating cells in that one year.

Where, as in the weeping willow and cherry, the excrescences are protruded much beyond the normal diameter of the tree, the annual layers of wood are on the average thicker, through having assimilated a greater share of food; as is generally the case with cells situated above an obstruction, for instance, as when a wire is fastened around a branch, a ring of bark taken off, or other means employed to interfere with the connection between root and foliage.

Mr. Meehan further said that explanation of growth in connection with these excrescences, explained also much that was usually inexplicable in the various excentricities of growth. He exhibited a specimen of a trunk of a *Bauhinia*, presented to the Academy by the Brazilian Centennial Commission, in which the wood seemed a mere fasciculus of many separate stems, forming a sort of ligneous mosaic work. The trunk was about six inches in one direction, and two in the other. The first year's growth, round the small pith, was circular; the subsequent ones irregular through the varying powers of growth in the germinating tissue. Very often, but a very small section of the previous year's circle of wood would germinate, in which case the whole growth would be made from that point pressing round and over, with great luxuriance, and enveloping the bark as well as wood of the previous year. Mr. Meehan thought it quite likely that the cases of *Wistaria* with bark between some of the annual layers of wood, might be explained in a similar way.[1] The subject of the excentricity of the annual layers of wood in trees could also be understood, keeping in mind the generating tissue, and its varying powers of life and transformation. Anything which favored nutrition in one part of the mass of cells more than in another, would increase their power of growth, and induce thicker layers at that point than in others. A very hot sun on one side, or in one season on one side, or on particular spots on one side, inducing an inordinate evaporation from those parts, would weaken the vital power of the cells just there. The germination would be weak, and the woody layer thin. Cold winds on one side in very cold weather would have the same effect in some cases. The continual blowing of trees always in one direction might favor assimilation by the cells on one side more than on the other, or even the closer proximity of some cells to healthy foliage or vigorous roots, would give them a great advantage over others, and the layer would thicken. In some plants there was pretty equally divided power. The whole mass of tissue seemed equally and regularly vitalized, and the generative tissue formed a new layer of wood of about equal thickness all round. But in other trees some masses of cells seemed to easily draw from the others more than their share, and the latter were correspondingly weakened. This was beautifully illustrated in the Hornbeam (*Carpinus Americana*). Here the irregularities in the thickness of the annual layers defied all system. They might be very thick at one point, and yet at an inch or two above or below the same layer, be very thin. The red cedar (*Juniperus Virginiana*) exhibited similar characters, except that the loss of generative power in some of the cells was more uniformly in a direction lengthwise with the stem. In a section he had recently examined the annual layers were tolerably regular for fifteen years. A young tree of the same species had then grown up close to it on one side, and the annual layers became thinner, finally ceasing there. The other sides grew on as before, the layers tapering, with the weakened vitality, to where the tissue was wholly at rest. So in various parts of the outline could be noted the time when various parts of the generative tissue lost vital power. In one part of the section, in a direct line from the centre, there was a continuous and nearly regular annual layer for over fifty years; but in many directions, by counting the rings or layers, the time could be traced when the tissue ceased to be generative or almost so, fifteen, eighteen, twenty-eight, and so on. All the cases of peculiar excentricities, *Hedera*, *Toxicodendron*, *Ampelopsis*, and the peculiar cases of ordinary timber trees, could be explained by this, so far as to note that the immediate law was a loss of generative power in the cells of the annual layer. Of course, the indirect causes leading to this would be very numerous, and left room for much more investigation. The remarks were made as much as possible in language divested of botanical technicalities for the benefit of those interested in the many other branches of science present; but those who would pursue the subject of wood-growth, as described here and applied to the explanation of excrescences and eccentricities, are referred to Sach's Text Book of Botany.

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[1] Since making the above remarks I have had brought to my attention that in 1873, M. Licopoli, of Naples, in some publication not known at this writing, has suggested that the appearance of bark mixed with the wood of *Wistaria* is due to the formation of woody matter by the bark, which wood then continues to grow, and leaves the bark, as it were, behind the wood, instead of being pushed steadily before, as in normal wood growth. Although sure that my facts were as I detailed them, it is pleasant to have the confirmation of my views of these abnormal wood growths in this independent way.

Mr. Martindale inquired if Mr. Meehan had noted the square growth of a coniferous trunk from the Pacific coast, on exhibition at the recent Centennial, and if that growth could be accounted for on his explanations?

Mr. Meehan replied that he had examined that trunk. It was square only at the lower end. It was of *Picea amabilis*. At the four corners the annual layers were thicker than at the sides. He had no doubt that in that case, and in similar ones if they were repeated, four strong roots had grown out at nearly equal distances, and the mass of cells nearest to these roots had an advantage in nutrition. We saw this in the trees of our own forests. Just in proportion to the vigor of the roots below was the thickness and irregularity of the trunk for a considerable distance above. If these trees had but four main roots of equal strength at equal distances, a portion of the trunk would be about square.

Mr. J. H. Redfield inquired whether Mr. Meehan would class cypress knees among the excrescences he had described?

Mr. Meehan replied not, as they were an outgrowth from the normal woody system of the roots of the tree, while the excrescences originated in the liber, or the tissue very closely allied thereto.

Pickeringite from Colorado.—Mr. E. Goldsmith stated that he has observed, in the Mineralogical Collection of the Academy, a white mineral which had not been determined. His examination, which was principally a chemical analysis, proved it to be the above-named species. As Peru and Nova Scotia are localities where this mineral has been found previously (see Dana's Descriptive Min., p. 653), this seems to be the first observation of Pickeringite in the U. S. Dr. John LeConte collected it. The particular note on his label is, near Monument, near Colorado City, Col. Terr.

The mineral is crystallized in very thin needles, which can only be seen when it is broken; these crystals keep within the mass well. Externally it is apt to become powdery. Its taste is astringent.

Hardness about = 1.
Specific gravity in oil of turpentine = 2.0105
" " " water = 1.7290

In the flame reaction he noticed the presence of sodium and potassium. The last element has been noticed by How in the Pickeringite from Nova Scotia. Sodium seems not to exist in the compound found in Nova Scotia or Peru.

The blowpipe reaction indicated water, alumina, and sulphuric acid.

The qualitative analysis proved also the occurrence of a minute quantity of proto and sesquioxide of iron, and magnesia was recognized to be in the solution.

The quantitative analysis gave this result:—

$\dddot{\mathrm{S}}$ = 38.69 per cent.
$\ddot{\bar{\mathrm{A}}}\mathrm{l}$ = 11.90 "
$\dot{\mathrm{M}}\mathrm{g}$ = 4.89 "
(Ka) $\dot{\mathrm{N}}\mathrm{a}$ = 0.68 "
Sand = 1.90 "
By difference $\dot{\bar{\mathrm{H}}}$ = 41.94 "
100.00 "